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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/633,372	08/01/2003	Anguel Nikolov	02-40171-US	5119
7066	7590	07/11/2005	EXAMINER	
REED SMITH LLP 2500 ONE LIBERTY PLACE 1650 MARKET STREET PHILADELPHIA, PA 19103			BOUTSIKARIS, LEONIDAS	
			ART UNIT	PAPER NUMBER
			2872	

DATE MAILED: 07/11/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/633,372	NIKOLOV ET AL.	
	Examiner	Art Unit	
	Leo Boutsikaris	2872	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 01 April 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-30 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-30 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 01 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 4/1/2005 has been entered.

Claim Rejections - 35 USC § 112

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

Claims 3 and 6 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

Claims 3 and 6 recite that the base and cap substrates comprise a metallic mirror. Based on the common definition of a mirror as being an optical element that *substantially* reflects incident radiation, the examiner cannot ascertain how light is transmitted through the device, as described in Fig. 7 and [0056]. A device, which is used as a phase retarder should transmit a

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substantial amount of incident light, and this is not possible if the outer layers are metallic mirrors.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 11 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 11 recites that the region that includes liquid crystals is substantially aligned with the structure of the periodic regions. This is not clear, since the claim language does not specify which dimension of the periodic region is aligned with the LCs. For examination purposes, it will be taken that the LCs are aligned along the axis where the periodic refractive index distribution is periodic.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 1-2, 4-5, 7-8, 13-23, 26, 30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unno (US 2003/0128349) in view of Lee (US 6,498,679).

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Regarding claim 1, Unno discloses a birefringent optical element 25 used for correction of intrinsic birefringence in optical systems comprising a plurality of optical elements such as lenses exhibiting intrinsic optical birefringence, said birefringent optical element producing arbitrary phase retardation between output polarization components 30 and 31 in response to incident radiation 26 operating about a central wavelength, wherein said birefringent element comprises a base substrate 25 and a layer of periodic index regions of alternating refractive indices applied to a first (top) surface of the substrate, said layer of periodic refractive indices having a periodicity of less than the central wavelength (Fig. 8, [0090]-[0096], [0107]).

However, Unno does not show the birefringent element 25 having a cap substrate adjacent to the layer of periodic index variations and distal to the base substrate. Lee discloses a birefringent element (Fig. 3), wherein the layer 202 responsible for producing birefringence is disposed between a base substrate 208 and a cap substrate 214 (lines 14-61, col. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to cover both sides of the birefringence producing layer with a substrate, for better protection of the layer (see lines 50-55, col. 3 in Lee).

Finally, the combination of Unno in view of Lee does not specify that the thickness of the device is less than about 10 microns. It is noted that Unno teaches that the thickness of the grating is chosen so that a desired amount of phase retardation is produced by the birefringent element ([0097], [0105]). Furthermore, it is disclosed that a thickness of about 27 microns is typical of the thickness required ([0157]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the birefringent element of Unno in view of Lee have a thickness of less than about 10 microns, since it has been held that where the general

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conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235. A thinner device with thickness in the claimed range is easier to incorporate with the rest of the optical elements, resulting in a smaller imaging system.

Regarding claim 8, the layer of periodic regions of alternating refractive indices includes alternating dielectric strips having a high index material and air gaps having a low index material ([0096]).

Regarding claims 2, 4-5, 7, 13, the dielectric material comprising the refractive index grating is the same material comprising the substrate, i.e., glass, which is intrinsically birefringent ([0089], [0090]).

Regarding claims 14-15, the device of Unno in view of Lee comprises an outer protecting layer, as described above.

Regarding claim 16, the outer protecting layer is index matched with the material comprising the two substrates (see layer 212 in Fig. 3 and lines 41-44, col. 3 in Lee).

Regarding claims 17-18, Unno does not specify that the high index of the grating is twice or thrice as large as the low index (an example of 1.6:1 ratio is given, [0096]). It would have been obvious to one of ordinary skill in the art at the time the invention was made to make the high index/low index ratio in the birefringent element of Unno in view of Lee have the claimed range, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235. The larger the difference between the adjacent

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dielectric strips is, the larger the produced anisotropy/birefringence becomes, which results in a birefringence element capable of correcting larger intrinsic birefringence in the optical system.

Regarding claims 19-23, there is no mentioning in the disclosure of Unno of any reflected light from the compensator device of Fig. 8; substantially all light incident on the grating is transmitted through, having acquired a phase retardation, which is enough to cancel intrinsic birefringence due to the rest of the optical elements upstream in the system.

Regarding claim 26, the alternating refractive indices alternate in one dimension (Fig. 8).

Regarding claim 30, Unno in view of Lee discloses all the limitations of said claim except for specifying that an etch stop is used during fabrication of the dielectric grating. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use an etch stop layer during the fabrication process of the structure of Fig. 8, since Official Notice is taken that using a sacrificial etch stop, especially during RIE micro-patterning fabrication procedures, is a widely known technique in the field of microlithography, due to the resulting higher accuracy in etching depths of the micro-pattern.

Claims 24-25, 27-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unno (US 2003/0128349) in view of Lee (US 6,498,679) and further in view of Shurtz, II (US 4,712,881).

Regarding claims 27-29, Unno in view of Lee discloses all the limitations of the above claims except for teaching that alternating refractive indices layer may be two-dimensional (i.e., being sectioned in pixels), or that multiple such layers may be used. Shurtz, II discloses a birefringent optical element, which act as an effective dielectric structure, wherein multiple

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layers of two-dimensional sub-wavelength gratings are used to produce a desired birefringence (Figs. 1, 4, lines 23-25, col. 2, 14-15, col. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to form a stack of two-dimensional sub-wavelength gratings, as taught by Shurtz, II, since the greater number of degrees of symmetry allows for greater flexibility in designing a structure that produces a desired amount of birefringence (see lines 29-36, col. 2 in Shurtz, II).

Regarding claims 24-25, Unno in view of Lee discloses all the limitations of the above claims except for teaching that AR coating is applied on the outer substrates. As described above, Shurtz discloses a birefringent artificial dielectric structure where AR coatings are applied on the back surface of the substrates (lines 45-48, col. 3). It would have been obvious to one of ordinary skill in the art at the time the invention was made to apply AR coatings on the two outer substrates of the device of Unno in view of Lee, for avoiding back reflections between the said element and the rest of the optical elements in the optical system.

Claims 9-12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Unno (US 2003/0128349) in view of Lee (US 6,498,679) and further in view of Sutherland (US 2004/0137204).

Unno in view of Lee discloses all the limitations of the above claims except for teaching that the sub-wavelength grating, capable of inducing birefringence comprises liquid crystals ("LCs"), whose orientation is affected by application of a voltage. Sutherland discloses a switchable optical element, comprising sub-wavelength LC gratings, which exhibits form birefringence ([0098]-[0103], Fig. 13). It would have been obvious to one of ordinary skill in the

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art at the time the invention was made to use LCs as the periodic medium that induces birefringence, instead of the dielectric structure of Fig. 8 of Unno, since it is much easier to (holographically) record gratings comprising LCs than patterning dielectric gratings using microlithographic methods.

Response to Applicant's Arguments

Applicant's arguments with respect to claims 1-30 have been considered but are moot in view of the new ground(s) of rejection.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Dr. Leo Boutsikaris whose telephone number is 571-272-2308.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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July 1, 2005



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